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8.—ON HELVITE FROM MT. FRANCISCO, N.W. DIVISION.

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Specimens of this rare and peculiar mineral not known to occur anywhere else in Australia were received from the old Congo Lease at Mt. Francisco (Pilbara G.F.) in 1927. It is a sulpho-silicate of beryllium, manganese, iron and zinc. The specimens received were brownish coated angular masses up to 2 inches across. The coating consists of a mixture of limonite and psilomelane derived from the alteration of the mineral: the psilomelane also penetrates into the cleavages. A strong octahedral cleavage was easily recognised on the specimens examined whilst in some cases partly developed octahedrons formed excrescences on the surfaces. Thin splinters are brown in colour, agreeing with Ridgway's 9′ m. "Carob Brown," but the mineral in mass is a mottled brownish black owing to the presence of decomposition products. The mineral is fairly brittle and breaks with an uneven fracture with a resinous lustre. It is isotropic and the refractive index was found to agree with a mixture of arsenic and antimony iodides and piperine in the proportion of 27.5 iodides to 72.5 of piperine, giving a figure for N of 1.765*. The specific gravity was found by immersing the mineral in pure methylene iodide and warming until the test piece was just suspended in the solution, then determining the specific gravity of the liquid at that temperature. This gave a figure of 3.314 for the mineral. The mineral is readily decomposed on warming with 10 E Hydrochloric acid with the evolution of sulphuretted hydrogen and the separation of silica.

The results of an analysis of the Mt. Francisco mineral are given in column A of the table below. The material taken for analysis was carefully selected, the powder being wholly isotropic and showing no signs of alteration products.

In columns B and C are the analytical figures for the type minerals helvite and danalite respectively.

	A. Helvite. Mt. Francisco.		B. Helvite. Schwartzenburg.		C. Danalite. Rockport.	
	%	Mols.	%	Mols.	%	Mols.
SiO_2	31·82	530	33·26	554	31·96	532
BeO	13·90	556	12·03	481	13·86	554
FeO	15·80	220	5·56	77	25·71	358
MnO	28·00	395	41·76	589	6·17	87
ZnO	7·76	95	...	...	19·11	235
S	5·75	179	5·05	157	5·93	185
H_2O	...	...	1·15	64	...	...
	103·03		98·81		102·74	
O = S ...	2·86		2·51		2·96	
	100·17		96·30		99·78	
Fe: Mn: Zn Ratio	1 : 1·8 : 0·4		1 : 7·7 : 0		1 : 0·2 : 0·7	
Be:(Fe, Mn, Zn) Ratio ...	3 : 3·9		3 : 4·2		3 : 3·7	

* This figure was also obtained by the writer for the refractive index of danalite from Rockport in Dr. E. S. Simpson's private collection.

It is to be noted that zinc is not recorded as being present in the helvite from Schwartzenburg. Possibly it was unsuspected and no attempt made to determine its presence or separate it from the manganese.

Helvite and Danalite are two members of an isomorphous group with the general formula $Be_3.R_4.(SiO_4)_3.S$ with R representing Mn, Fe and Zn. The end members of this group are

$Be_3.Mn_4.(SiO_4)_3.S$ Helvite.
$Be_3.Fe_4.(SiO_4)_3.S$ Danalite.
$Be_3.Zn_4.(SiO_4)_3.S$ Unknown.

Numerous complex formula have been put forward for this group but a critical examination of the published analyses suggests that many of them are based on incorrect analytical figures, due, in many cases, to incomplete separation of beryllium from manganese, iron and zinc.

The formula derived from the analysis of the Mt. Francisco mineral is

$$BeO_{558}.RO_{710}.SiO_{2530}.S_{179}$$

This simplified gives

$$BeO_{3\cdot10}.RO_{3\cdot95}.SiO_{2\cdot95}.S_{1\cdot00}$$

which may be stated

$$Be_{3\cdot10}.R_{3\cdot95}.Si_{2.95}.O_{11\cdot95}.S$$

which is very close to the type formula.

The predominating member of the R group in the Western Australian mineral is manganese, the ratio of that constituent to iron and zinc respectively being 1.8 : 1.0 : 0.4, the mineral, therefore, being a ferruginous helvite which has not been previously recorded in this or any other State of the Commonwealth.

By Authority: Fred. Wm. Simpson, Government Printer, Perth.